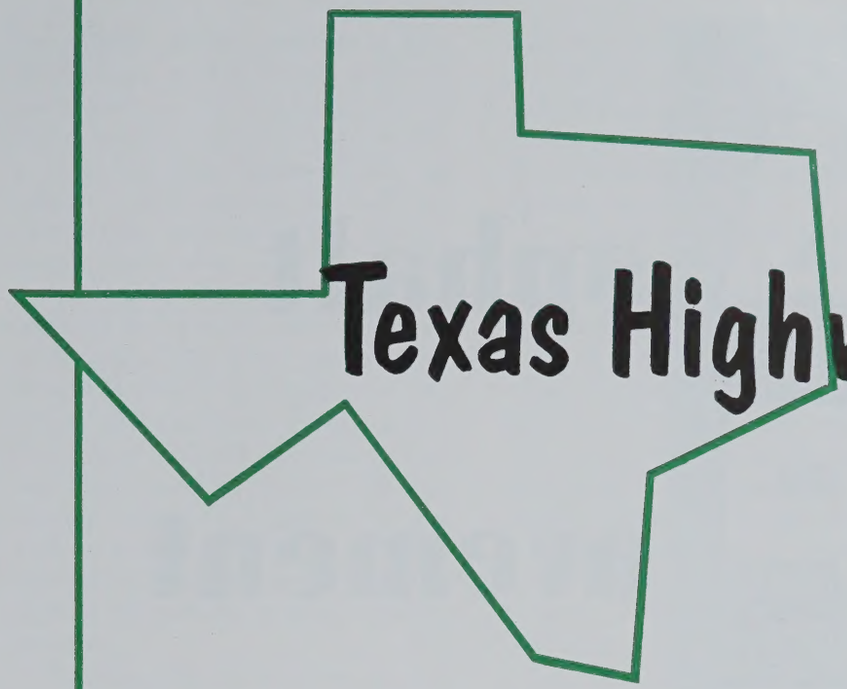
Texas Highways

August, 1958 35c

Sunset over the bay at Port Isabel.



Texas Highways

Volume 5 • Number 8

August, 1958

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Asphalt Pavement Failures in District 4

Richard C. Crandall, Senior Laboratory Engineer
District 4

DISTRICT 4 has had some minor troubles with single and multiple surface treatments. The serious difficulties, however, have been with short sections of hot-mix asphaltic concrete pavement. Last summer and early last fall, approximately 60 miles of very satisfactory hot-mix asphaltic concrete pavement was laid in this District; however, on some short sections of pavement, a stripping and raveling problem developed. Specifically, a two-mile section of U. S. Highways 87 and 60, extending from the north city limits of Canyon to the Caprock, developed serious raveling in several spots. This section of asphaltic concrete was placed on an existing portland cement concrete base, so, on this particular project, base failure could not have been a factor.

Actually it appears that all of the failures which have occurred were in the asphaltic concrete pavement itself, beginning with a raveling at the surface, and eventually wearing through to the underlying base. All of these failures occurred on sections placed in cool weather and were subjected to moisture, in the form of either rain or snow, soon after being opened to traffic. Practically no failures have occurred on recent projects that could have been attributed to base failure. Therefore, the remainder of this discussion will be limited to an attempt to present ideas about the cause and possible corrections for the type of failures encountered in this District.

A study to determine the reasons for these failures and to evaluate the various remedial methods suggested was undertaken. The results indicated that two basic steps should be taken:

(1) A re-evaluation of specifications and methods of testing of the two basic materials comprising hot-mix asphaltic concrete, namely asphalt and mineral aggregate.

(2) A review and revision, if neces-

sary, of methods now employed for mixing, spreading, and compacting the asphaltic concrete mixture.

In making this study, invaluable advice and assistance was received from J. R. Harris and Jeff Seay of the Construction Division, and A. J. Hill of the Materials and Tests Division. Reports and recommendations have been received from both of these divisions discussing the raveling or surface wear on the project mentioned above.

In line with these recommendations the following special provisions have been recommended to the Chief Engineer of Highway Design for use on all projects where hot-mix asphaltic concrete is used in District 4:

(a) The plastic index of that portion of the fine aggregate passing the Number 40 sieve shall not exceed 5, when tested by THD-53 procedure.

(b) Dry-mixing time in the pugmill mixer shall be a minimum of ten seconds. The wet-mixing time shall be a minimum of 20 seconds, for a total minimum mixing time of 30 seconds.

(c) The coarse aggregate shall be so crushed that 80 per cent of the particles shall have more than one crushed face.

(d) Road-density tests shall be made, and the road density obtained shall not be less than 95 per cent of the corresponding laboratory density. These tests shall be made within 48 hours after placing the pavement.

(e) A self-propelled pneumatic roller shall be required as a part of the rolling equipment.

Provisions (a) and (b) are intended to clean up the materials. Tests run in the District Laboratory, and by the Materials and Tests Division on asphaltic concrete from some of the failing sections indicate a relatively high plastic index. Observations made on the aggregate used in these sections revealed that a clay coating had been baked on the aggregate while passing through the drier drum. Although all of the materials used were well within the standard governing specifications, it is believed that certain corrections need to be made. The lower plastic index provision should encourage the contractor to clean up his materials. The required ten-second dry-mixing time has been found to remove the clay coating from the aggregate by the violent scouring action of the pugmill mixer. Also, this dry-mixing time appears to provide a more uniform mixture.

Provision (c) is intended to provide a more stable mixture. Tests performed in the District Laboratory indicate that the local mixes would be benefited to some extent by an increase in the per cent of bitumen, provided that adequate stability could be maintained. Also tests have indicated that a crushed face is somewhat more resistant to stripping than a smooth surface.

Provisions (d) and (e) are intended to increase the initial road density of the pavement. Laboratory tests on the failed sections indicated a relatively low density that may in part be responsible for the stripping and subsequent raveling of the mixture.

Incidentally, District 4 has a standard special provision which provides that no hot mix asphaltic concrete shall be placed between November 1 and April 1. It may be that at some future date, improved methods of placement and compaction will allow this open season to be extended.

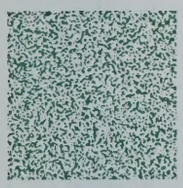
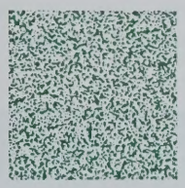
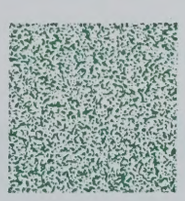
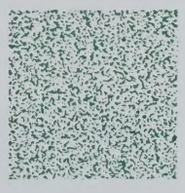
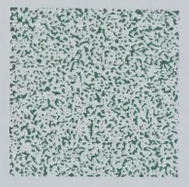
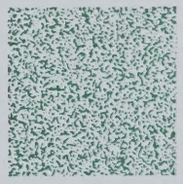
Since all of the asphalts used are from approved sources and meet the current specifications, these studies and recommendations were confined to that portion of the mix over which direct control can be exercised—the mineral aggregates.

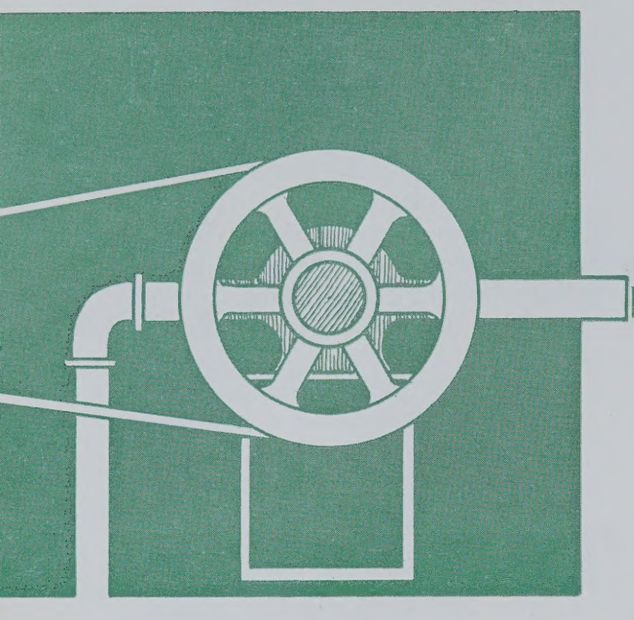
Of course the special provisions recommended above are not a cure-all for hot-mix troubles; however, we hope that they will minimize difficulties such as those which occurred last winter on the section of U. S. Highways 60 and 87 previously mentioned.

A great deal of work has been done, and is being continued in the District Laboratory on the local stripping problem. Perhaps information gained by this research will result in a better and more durable asphalt pavement.

The District 4 laboratory now has the apparatus for conducting what is known as the Sand Equivalent test. (Reference — Highway Research Board Proceedings, Volume 32, 1953.) This test is now being used by the California Highway Department to determine the quality of the material passing the Number 4 sieve. Basically, this test is designed to show up harmful amounts of detrimental clays in a material. This test may have great possibilities as a quality-control test for asphaltic concrete aggregates, but at the present time an insufficient amount of data has been accumulated to justify including a specification requiring a certain sand equivalent.

Research should continue into materials for hot-mix asphaltic concrete, both on the state and district levels. This should include an investigation of the adhesive properties of the asphalts being used, as well as further research into the quality and types of aggregates making up the hot-mix asphaltic concrete pavements.



rotary pumps for the sign-washing machine

Herman Scheeman Jr., District Maintenance Engineer
District 16

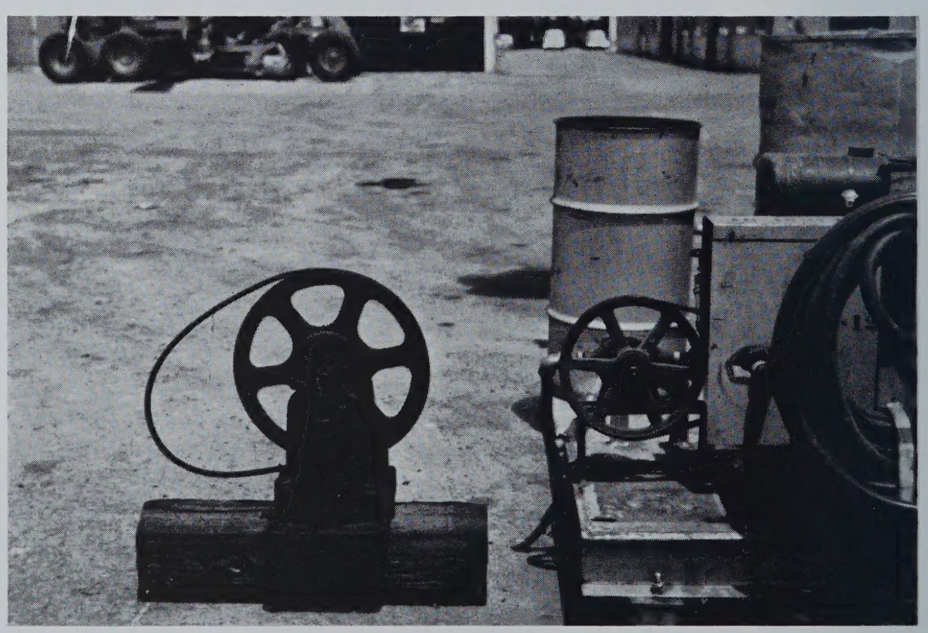
In March 1958, District 16 received a sign-cleaning machine from Camp Hubbard which was used with good results.

After a year, the piston pumps used in pumping the detergent and rinsing water began to wear. This wearing first took place on the guides for the pistons, causing the pistons to wear. No provision was made to keep the guides oiled, and they were exposed to dirt, which caused them to wear much faster.

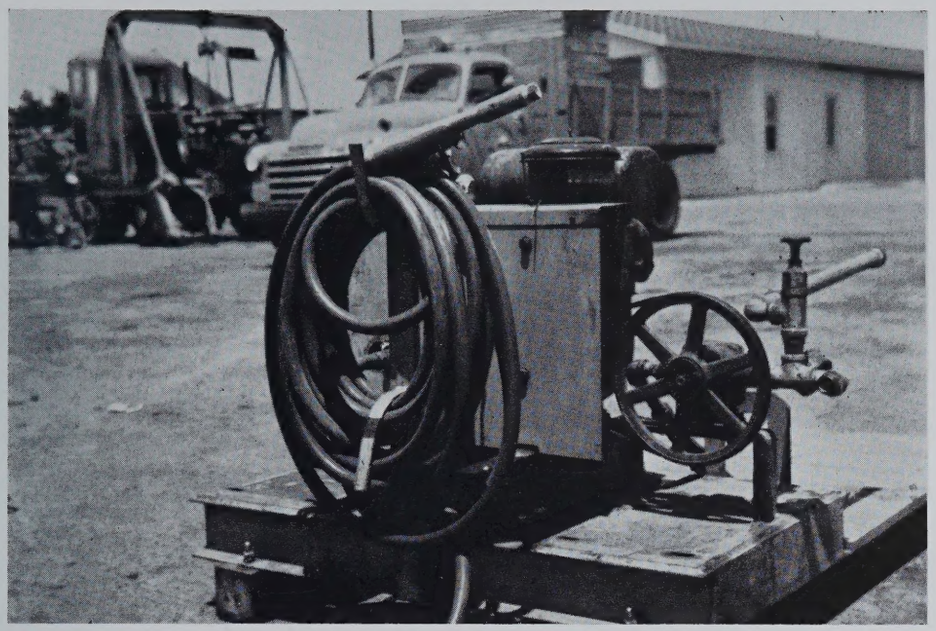
To eliminate the trouble, the piston pumps were replaced with rotary pumps. These pumps are operated at approximately 500 rpm by using a two-and-one-half-inch pulley on the engine and a ten-inch pulley on the pumps. This gives sufficient pressure and water volume to properly wash signs. According to the manufacturers rating, at 600 rpm and 100 pounds of pressure, the pumps will deliver six gallons per minute.

Material in the rotary pumps is nickel-copper-chromium ferrous metal which gives corrosion and abrasion resistance. Rollers are nylon and easy to replace. The intake and output ports are threaded for three-fourths-inch pipe. Weight of the pumps is approximately ten pounds. The piston-type pump weighed 105 pounds, and this decrease in weight makes the sign-washing machine easier to handle.

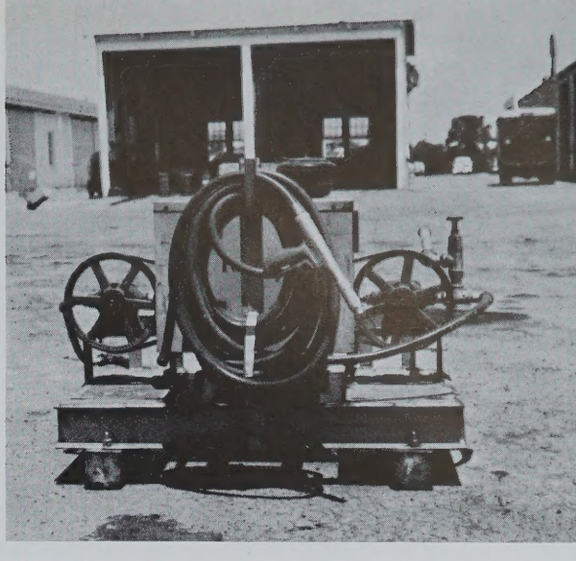
We are well satisfied with the rotary pumps. They have not caused any trouble. We thoroughly rinse the detergent pump at the end of the day whenever it is used.



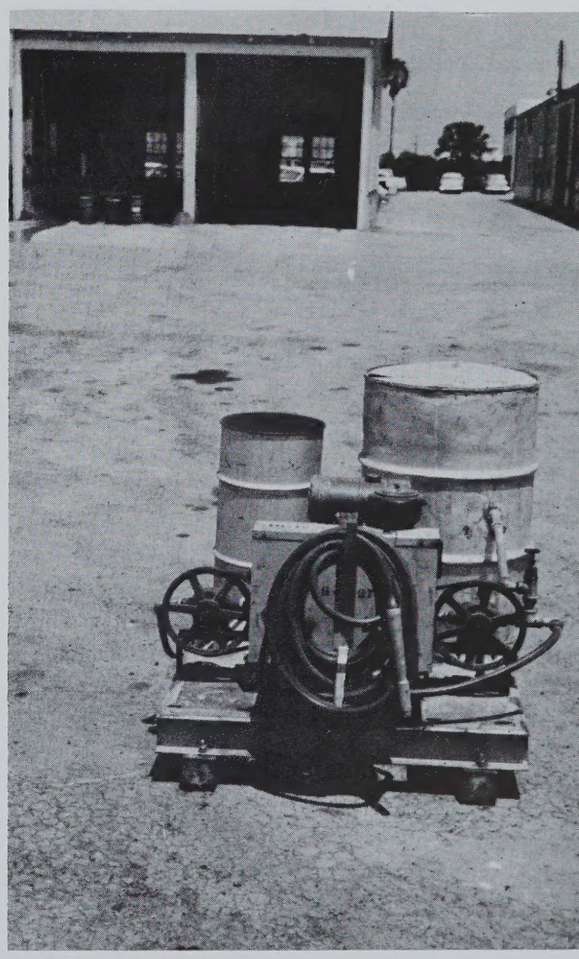
The old piston pump, at left, weighs 105 pounds. The rotary pump is a light ten pounds.



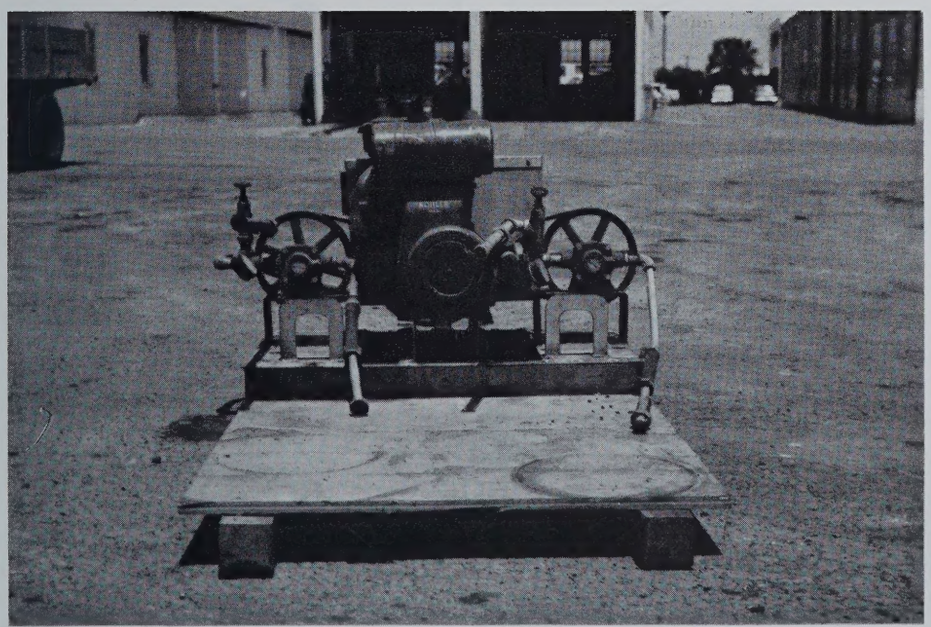
This picture of the mounted rotary pump shows the regulator and pressure gauge.



This front view shows the sign-washing machine with the tanks removed.



Completely assembled sign-washing machine.



Rear view.

District 2

personnel rating

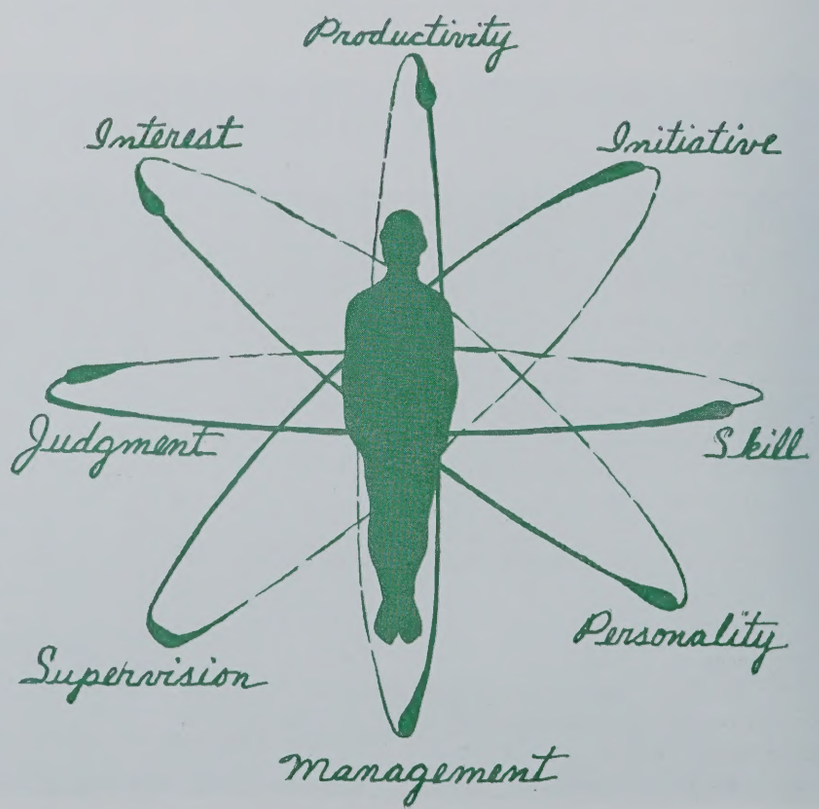
W. W. Potter, District Administrative Engineer
District 2

THE anticipated increased volume of highway design and construction work and the subsequent engineering manpower situation have given impetus to studies centered on personnel employed in District 2 of the Highway Department. As a result of these general studies, a specific method of rating personnel has been developed and, so far, has proved satisfactory. This rating technique provides opportunity for developing a better understanding of our employees and their various capabilities.

Some aspects of this system are cold facts. Others are concerned with evaluating the human effort of our employees. Education and experience can be recorded, tabulated, and handled as statistics. The remaining items, which are more or less intangible, concern a history of customs followed by individual supervisors, an environment of human intention, past and present, which make it one thing today and something else tomorrow. The possibility of these human connotations should alert everyone to guard against definite favoritisms. This technique must be impartial. There must be a careful comparison by groups of all employees.

This article presents, specifically, information about the personnel forms used in rating our monthly personnel, charts on which these ratings are noted, and the resultant corrective measures in salary adjustments. More generally, however, it is intended to deal with some features of finding and reporting facts about personnel and to discuss some fundamentals of individuals which are often passed over. This is especially needed in an atmosphere of mass corrective salary measures.

Employees are separated into three categories — Accounting and Warehouse, Maintenance, and Engineering. The Engineering organization is further divided into pay groups 1, 2, 3, 4, and 5. Group A, the Rodman and Checker class, is not rated. All employees of the first four groups are rated under the supervision of the District Administrative Engineer aft-



er consultation with Group 5 supervisors. Group 5 personnel are rated by the District Engineer after consultation with Group 6 supervisors in the District.

A clear understanding of the following terms used in the Personnel Rating Forms is essential before employees can be rated properly.

1. Productivity—quality or state of producing; the amount or volume of work which the employee can perform or have performed.
2. Initiative—the energy or aptitude displayed in the initiation of action; self-reliant enterprise; self-initiated activity.
3. Skill—the ability to use one's knowledge effectively; technical proficiency.
4. Personality—distinction or excellence of personal and social traits in getting along and being able to work with fellow employees, contractors, the general public.
5. Management—degree to which employee can conduct, control, and direct his work to accomplish most judiciously the assigned objective.
6. Supervision—ability to explain and direct critical evaluation of work and degree of proficiency in this area.
7. Judgment—the ability to make a proper decision at the most opportune time; the exact moment to be firm or to ease up; ability to compare and discriminate in order to arrive at a knowledge of values and relations.
8. Interest—the degree to which an employee is interested in his work, possibly, above and beyond the normal 40-hour work week.

Form 1, Accounting and Warehouse; Form 2, Maintenance (Monthly Employees only); and Form 3, Engineering (Groups 1 through 4) are similar in that they are divided into the same three general sections—education, experience, and aptitude. Aptitude embraces four subsections: productivity, initiative, skill, and personality. However, as these sections and subsections vary by groups, we will discuss each one separately.

Form 1, Accounting and Warehouse:

1. Education (Maximum 10 Points). This maximum is given for a high-school graduate, which incidentally is required of all monthly employees in the District. Please note that no credit is shown on this form for any college training. However, bonus points are included on the final ratings for all employees qualifying in this category.

2. Experience (Maximum 25 Points). This item is self-explanatory.

3. Aptitude (Maximum 65 Points). Please note that this total weight exceeds the total weight of the same section of the other groups. It is our thought that these four subsections are more important than a formal college education in this particular category of employees.

Form 2, Maintenance (Monthly Employees only):

1. Education (Maximum 10 Points). The educational requirements are the same as for Form 1. However, we do not give bonus points for any formal college training in this category.

2. Experience (Maximum 40 Points). The weight of this item was increased over the same item in Forms 1 and 3. Experienced maintenance employees are an extremely valuable asset to an organization.

3. Aptitude (Maximum 50 Points). This item is self-explanatory.

Form 3, Engineering (Groups 1 through 4):

1. Education (Maximum 25 Points). The maximum value of this item is increased over the same item in other groups. Employees in this category are required to use technical or formal college training to a greater degree in the work they perform.

2. Experience (Maximum 25 Points). This item is self-explanatory.

3. Aptitude (Maximum 50 Points). This item is self-explanatory.

Form 4, Engineering (Group 5):

Employees in this group have reached a plateau in their careers far different from groups A, 1, 2, 3, and 4. Consequently, a considerably different form is used in rating this group.

1. Education (Maximum 5 Points). Less weight is given this item than in the other groups, but in all probability any formal college training will have some bearing on the values of other items in this group.

2. Experience (Maximum 25 Points). Note at bottom of Form 4 is self-explanatory.

3. Capability (Maximum 70 Points). This broad section is composed of seven items: management, supervision, judgment, initiative, skill, interest, and personality. These items are included in the explanation of terms. Each item has a maximum value of 10 points.

We believe that it is much easier to rate all employees in a particular group for one item, such as management, before the other items are considered. We have found that it is easier to rate employees in this manner than to consider all items at the same time.

We wish to emphasize that the purpose of rating our employees is for a comparison of the employees available. Of necessity, this is by group and is used so that an equitable salary scale may be observed with the thought in mind that our people should be paid for the work they perform. As a result, the more efficient and productive employees will receive the highest salaries. In no way do we endeavor to compare our employees with any employees in other Districts.

A chart is prepared for each group, and all employees are plotted on this chart in accordance with their salary and rating as determined from the personnel rating form. The vertical and horizontal scale on the charts may be variable as required. The ordinate is for the rating of the employee; the abscissa is for the salary. The circles are the individual ratings of the various employees with names withheld.

The line shown on these charts can

FORM 1

FORT WORTH - DISTRICT 2

PERSONNEL QUALIFICATION
ACCOUNTING AND WAREHOUSE

Name _____ Group _____

Title _____

1. Education

High School

2 Points per year, plus 2 for graduation (Max. 10)

Total (Maximum 10) _____

2. Experience (As of _____)

With Texas Highway Department

2 Points per year in grade
1 Point per year in lower grade

Other Experience

1 Point per year in equal grade

Total (Maximum 25) _____

3. Aptitude

Productivity (Maximum 17)
Initiative (Maximum 17)
Skill (Maximum 15)
Personality (Maximum 16)

Total (Maximum 65) _____

Grand Total (Maximum 100) _____

DATE _____

RATING BY _____

FORM 2

FORT WORTH - DISTRICT 2

PERSONNEL QUALIFICATION
MAINTENANCE

Name _____ Group _____

Title _____

1. Education

High School

2 Points per year, plus 2 for graduation (Max. 10)

Total (Maximum 10) _____

2. Experience (As of _____)

With Texas Highway Department

3 points per year in grade
2 points per year in lower grade

Other Experience

1 point per year in equal grade

Total (Maximum 40) _____

3. Aptitude

Productivity (Maximum 13)
Initiative (Maximum 13)
Skill (Maximum 12)
Personality (Maximum 12)

Total (Maximum 50) _____

Grand Total (Maximum 100) _____

DATE _____

RATING BY _____

FORM 3

FORT WORTH - DISTRICT 2

PERSONNEL QUALIFICATION

ENGINEERING - GROUPS 1-4

Name _____ Group _____

Title _____

1. Education

High School

2 Points per year, plus 2 for graduation (Max. 10)

College

3 Points per year of Engr., plus 3 for Degree (Max. 15)
2 Points per year of Related Work, plus 2 for Degree
1 Point per year of other, plus 1 for Degree

Total (Maximum 25) _____

2. Experience (As of _____)

With Texas Highway Department

2 Points per year in grade
1 Point per year in lower grade

Other Experience

1 Point per year in equal grade

Total (Maximum 25) _____

3. Aptitude

Productivity (Maximum 13)
Initiative (Maximum 13)
Skill (Maximum 12)
Personality (Maximum 12)

Total (Maximum 50) _____

Grand Total (Maximum 100) _____

DATE _____

RATING BY _____

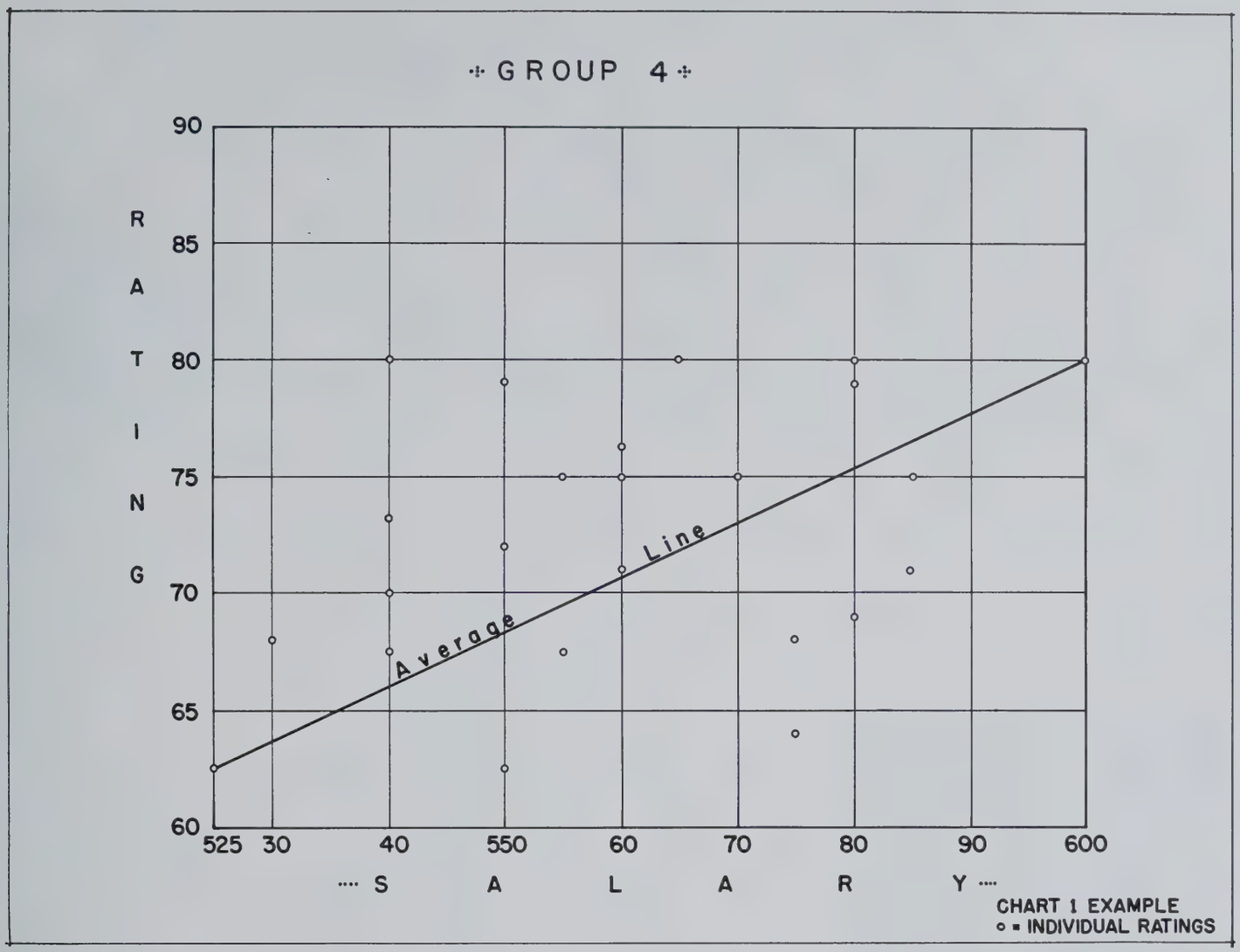
FORM 4

DISTRICT 2

PERSONNEL RATINGS - GROUP 5 - ENGINEERING

NAME	1 EDUCATION (Max. 5)	2 EXPERIENCE (Max. 25)	CAPABILITY (Max. 10 each) MANAGEMENT	SUPERVISION	JUDGMENT	INITIATIVE	SKILL	INTEREST	PERSONALITY	TOTAL

Note:
Education - 1 pt. per year of college (Engineering) plus 1 for Engr. Degree
Experience
Hwy. Dept. - 3 pts. per year in Gp. 5
2 pts. per year in Gp. 4
1 pt. per year in Gp. 3
Other - 1 pt. per year in grade comparable to Gps. 4 or 5



be called the average line—the performance level of the average individual or individuals in a particular group. The line is arrived at, generally, by plotting the employee with the minimum acceptable level of performance as the lowest level. This would represent the least amount of production, the poorest quality of work, the most negative attitude, and obviously, the lowest salary. The highest point on the opposite end of this line is determined by plotting the employee with the highest rating or highest level of performance. This employee, in our opinion, represents the top limit of the potential in this particular group. This could be called the maximum performance. The employee's abstract intelligence, physical stamina, and his aptitude, combine with all the other qualities to set this top limit of employee performance.

This average line then, is drawn from the lowest to the highest points. It is used in considering requests for salary increases for various employees. Those employees plotted to the right and below this line are theoretically overpaid; and those plotted to the left and above this line are theoretically underpaid.

Employees fall into several types or categories. Some will always do outstanding work and will always be near the 100 per cent level of performance regardless of the quality of supervision that they have. Others, of course, will do mediocre work and remain near the low level of performance.

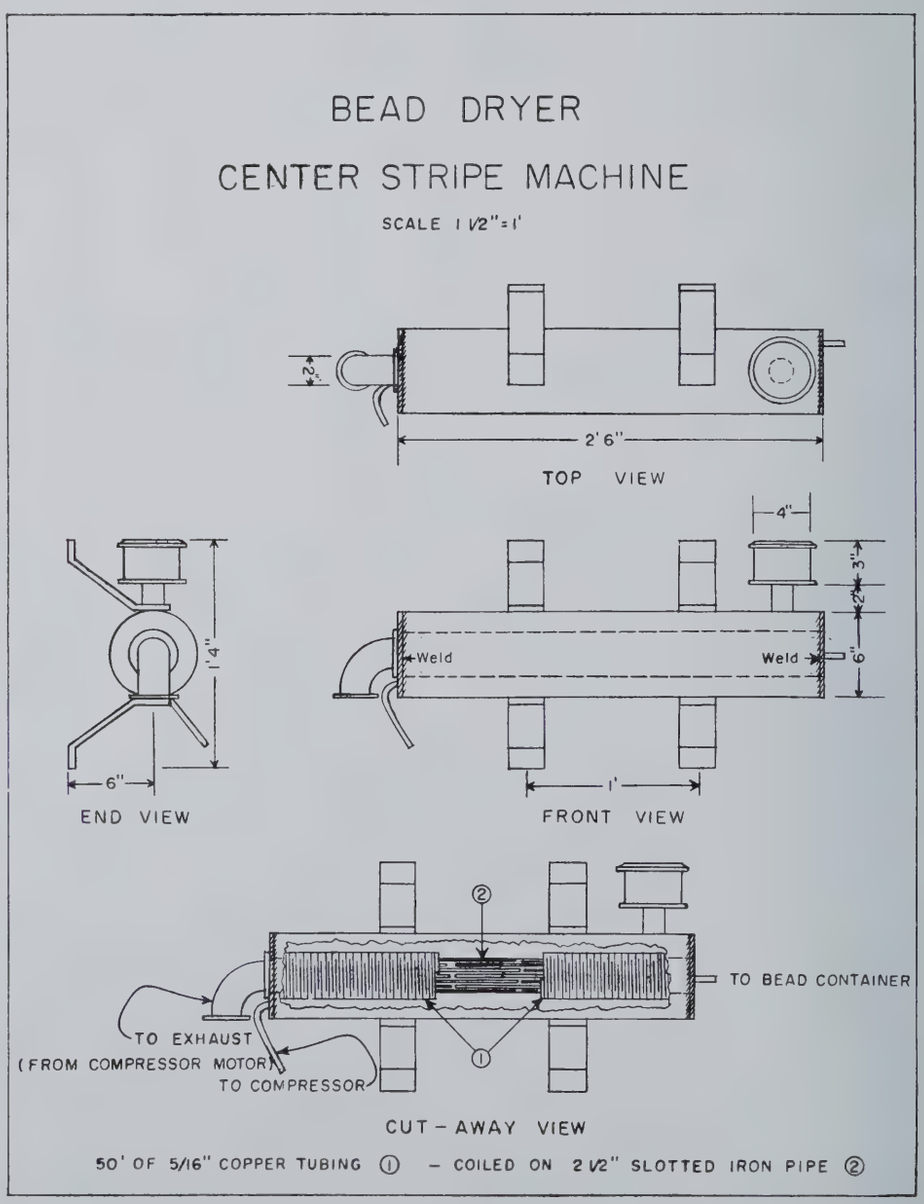
The actual level of performance for all employees, however, will be determined by their interest, motivation, incentives, and understanding of their jobs. These are the factors along with other previously mentioned, that we have attempted to determine in arriving at a fair and impartial rating system for our employees.

We have endeavored to create a means of looking at our organization objectively and to examine and correct our shortcomings personnelwise and salarywise with minimum turnover of trained employees. This has proved beneficial in our organization, but we realize that it solves only a portion of our problems. However, it is our sincere wish that this article may be of some assistance and value to others. It was with this thought in mind that this paper was prepared.

bead dryer for center-stripe machine

R. N. Jennings, District Maintenance Engineer
District 7

W. A. Vannoy, Senior Equipment Supervisor for District 7, noted that in District 14 air to the bead container for their center-stripe machine was heated by a pipe from the compressor to the bead container going through the exhaust gases of the compressor. Vannoy changed this device somewhat for use in District 7 by placing a coil around a slotted core. This raised the temperature of the heated air as the added amount of tubing exposed the air to the hot exhaust gases for a longer time.



So you're in a Big Hurry

Alton Vordenbaum, Senior Right of Way Agent
District 15

Trip Miles	Miles per hour (Average)	Time Hrs.	Time Min.	Minutes saved each 10 m.p.h increase
25	30	0	50	
25	40	0	38	12
25	50	0	30	8
25	60	0	25	5
25	70	0	21	4
25	80	0	19	2
50	40	1	15	
50	50	1	0	15
50	60	0	50	10
50	70	0	43	7
50	80	0	38	5
75	40	1	53	
75	50	1	30	23
75	60	1	15	15
75	70	1	4	11
75	80	0	56	8

Note that very little time is saved by higher speeds. If an accident does occur, the higher the speed, the more severe it usually is.

— THINK IT OVER —

BRIDGE REPAIRS

J. M. Owens, Assistant District Engineer
District 14

The east abutment of this F. M. 1100 bridge began its movement on June 10 of 1957.

Shortly after midnight on June 10, 1957, a resident in the area between Kimbro and Elgin called Tom Griffith, Senior Maintenance Foreman at Taylor, and reported that something was happening to a small bridge on F.M. Highway 1100 about one mile east of the Kimbro community.

Investigation that night revealed that the top of the east abutment had moved toward the stream about fifteen inches and that the east bridge approach had begun to settle. Barricades and flares were placed that night and traffic detoured over a country road. Early the next morning the top of the abutment had moved about twenty inches from its normal position. By the time we had braces in place, the top of the abutment had moved a total of 46 inches.

A survey of the damage the morning after disclosed that by then the east abutment had moved 20 inches, and by the time braces were placed, it had moved a total of 46 inches.

An inspection of the bridge was made by Wayne Henneberger of D-5, Archie Sherrod, then of D-18, and the writer, early on June 10. We agreed that we could save the structure by jacking the bridge up and replacing the abutment. This old structure was built in 1923. It was removed from the Highway System in 1940 when U. S. 290 was relocated, and came back into the System in 1955 as F.M. 1100.

Our bridge crew moved in on the afternoon of June 10 and worked until the east abutment was braced with two twelve-inch by twelve-inch by 53-pound H-beams to prevent further movement. Steel H-beam piling was then driven as close to the bridge as possible and about six feet from the abutment. It was capped with a 27-inch I-beam. The web of the I-beam was reinforced by welding stiffener plates to it to prevent crushing. The I-beam was used as a base for jacking the girder span back into its normal position. It was held by blocking until the new abutment could be

On investigation, representatives of D-5, D-18, and District 14 decided that the structure could be saved by jacking the bridge up and replacing the abutment.

The east abutment is braced with H-beams to eliminate further movement.

Steel H-beam piling is driven as close as possible to the bridge, and capped with a 27-inch I-beam.

Old wingwalls are removed by drilling and shooting.

With the new abutment wall in place, the old one is cut above the footing, later becoming part of the riprap.

The repaired bridge is now serving motorists once again. It was built in 1923, removed from the Highway System in 1940, but came out of retirement in 1955.

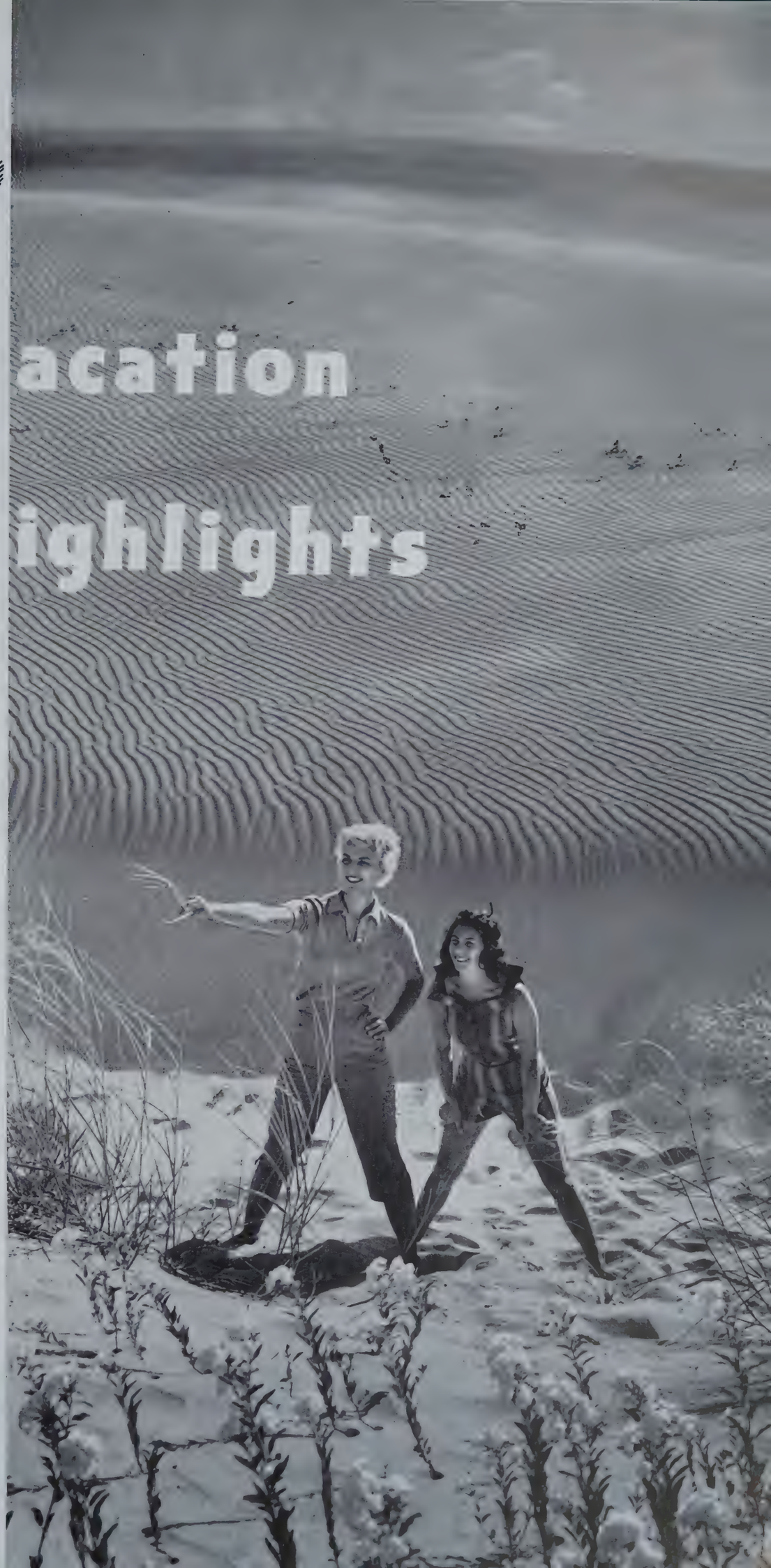
placed and the old one removed.

With the girder span back in normal position, the fill at the east approach was removed to the extent that holes could be broken through the old abutment footing. Three piling were driven through the footing as close to the bridge end as possible. They were encased in a concrete wall with a bracket for a bridge seat. After the abutment wall was in place, the wingwalls of the old abutment were removed by drilling and shooting. When the wingwalls were removed, the old abutment was cut just above its footing so that when the braces, blocking, and temporary cap were removed, the old abutment was laid down in the channel and later became part of the riprap.

After the old abutment was laid down, new wingwalls were placed, channel work completed, and riprap placed to complete the job.

Vacation Highlights

THIS MONTH, with vacationers hitting the highways at 90 to nothing, we offer a few shots of scenes along the way. There are millions of things to see in Texas, some established tourist attractions, others sidelights along the highways.



Monahans Sandhills State Park, just off U. S. 80 near Monahans, has hills of pure sand ranging to a height of 60 feet. Thousands of years ago, small lakes and tall grasses abounded here, and elephants came to feed. Indians hunted them with fluted dart points. Tourists uncover arrowheads and other Indian relics daily at the park.

Shrimp boats at anchor in Aransas Pass are viewed through the trawl, the large Y-shaped net which is pulled behind the boat. In Texas, shrimp fishing is the mainstay of the commercial fishing industry.

Almost 90 per cent of Texas' refineries are located along the Gulf Coast, but this one stands on U. S. 80 between Big Spring and Stanton. »

« *In the piney woods of East Texas, this is a familiar sight. Timber, stacked off State Highway 94 southeast of Lufkin, is ready to be hauled to mill by train.*

The historic past mingles with today as these Texas children of Mexican descent play in the ruins of the old cloister of San Jose Mission in San Antonio.

A Retiring Employee Speaks

Paul B. Bruchmiller retired from the service of the Texas Highway Department on June 30, 1958, at 67.

He wrote the letter which follows on May 21 of this year, to District Engineer T. O. Foster expressing his appreciation for the jobs he has held with the State.

Bruchmiller was born in Goliad County on October 1, 1890, and generally followed the carpenter trade before he joined the Department.

On January 26, 1931, he went to work in the Beeville Section as Mechanic Painter. In June of that year he suffered a broken arm and shoulder in a fall when a truck hit the Medio Creek Bridge on which he was working. He was hospitalized for ten days or so and then returned to work in October, 1931, as a night watchman at the District Shops.

In April, 1934, he went back to carpenter work in the District Shop and has been at this kind of work ever since, except for a period from October, 1940, to August, 1946, when he helped build and maintain the Corpus Christi Naval Air Station. Foster says of Bruchmiller, "During his service with the State he has been a faithful and highly skilled employee, and the Department has benefited considerably from his services."

"Apparently from his letter, Bruchmiller thinks that the State Highway Department is a good outfit to work for. We believe that a similar feeling exists in a great many of our employees, and that this attitude is the biggest single factor in creating the reputation which the Department presently enjoys," Foster added.

Dear Mr. Foster:

As I approach the time to retire from employment with the State Highway Department, I take great pleasure in expressing my deepest gratitude for the long term of service I have been privileged to enjoy.

Many changes have come since I began service with the Department in January, 1931, all of which have made State employment much more attractive to employees and provided a system of service for the public interest we can feel justly proud of being a part.

I must say I feel humble for the service I have given.

Please accept my sincere appreciation to the Texas Highway Department, to yourself, and to all of the employees of District 16, for many kind considerations extended me during these years.

Yours very truly,

Paul B. Bruchmiller

Case for Continuously Reinforced Concrete*

A. F. Beck, Resident Engineer
District 18

*Speech presented at the Thirty-second Short Course.

THE control of cracking in concrete pavements has been a problem for many years. Proper joint spacing using the contraction design has improved the service quality of rigid pavements to a marked degree, but the joint itself presents the most troublesome feature of this pavement type. One method of eliminating joints is to reinforce the slab from one end to the other and let cracks form at random. If the cracks are small enough to keep out water and dirt, then they should not present a problem.

With this in mind, plus the excellent performance of reinforced slabs on the Columbia Pike built in 1921 near Washington, D. C., it was decided to construct some continuously reinforced slabs in Indiana on a heavily traveled, heavy-duty highway. The Indiana project was completed in 1938 and has surpassed all expectations, both servicewise and maintenancewise.

Because of the success of the Indiana project, other states have built continuously reinforced pavements of varying depths and lengths. Several of these pavements can be found in Fort Worth, on U.S. 81 (south) and S.H. 550 (west). The Fort Worth pavements are now seven years old and have proven extremely successful.

Continuously reinforced pavements are comparable in cost with standard pavements when both construction and maintenance are considered, and have exceptionally smooth riding surfaces. Because they usually do not require maintenance, they are recommended for use on the heavily traveled, heavy-duty highways.

This paper discusses such things as pavement depths, reinforcing requirements, bases, subgrades, joints, and comparative pavement costs. First, though, let us see what continuous reinforcement is, what designs have been used, and how continuously reinforced pavements have performed.

A continuously reinforced concrete pavement is simply a reinforced concrete pavement, without joints, in which the reinforcing is continuous from one end to the other, regardless

of length. Cracks form at average intervals of four and one-half to twelve feet, depending upon the amount of reinforcing. More reinforcing means more cracks. These cracks are so small that they are not affected by the presence of dirt and moisture and they can not be seen nor felt by one driving over them. Sealing is not required.

Figure 1 represents the typical cracking pattern of a continuously reinforced pavement. About 50 per cent of the cracks form during the first year. The interesting feature here is that the ends of this slab are uncracked for a distance of 50 to 150 feet and cracking in the central portion of the slab comes at irregular intervals of one to fifteen feet. The reason that the ends remain uncracked is that they are free to expand and contract over the subgrade. Restraint of the central portion causes close crack spacing when the slab contracts.

Figure 2 is a table of some of the existing continuously reinforced projects for which data has been published. Each of these pavements is subjected to heavy loads and high volumes of traffic. Most of these pavements are on the Interstate System and are of expressway design. Note that the oldest pavement shown is in Indiana and that it is now nineteen years old. Also note that pavement depths, as shown in Figure 2, have varied from seven to ten inches and that some pavements have had bases while others have not. According to Figure 2, reinforcing has varied from .07 per cent to 1.82 per cent. Reinforcing for continuously reinforced pavement is expressed as a percentage of the longitudinal steel area to the concrete area. Thus, in a seven-inch slab, .3 per cent would represent one-half-inch-round at nine-inch center to center and .5 per cent would represent five-eighths-inch round at nine-inch center to center.

These pavements have retained their smoothness and have performed extremely well, even the seven-inch slab with small amounts of reinforcing. Failures have been attributed to pumping at a few construction joints and at expansion joints, to subgrades, and to reinforcement failures where .07 per cent and .11 per cent were used. Maintenance has been limited to correcting these few failures.

Figures 3, 4, and 5 show pictures taken in December, 1957, of the Indiana, Illinois, and Fort Worth projects. These pictures show the type of cracking and the type of failures encountered.

Subgrades

Subgrades for continuously rein-

TYPICAL CRACKING PATTERN OF

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

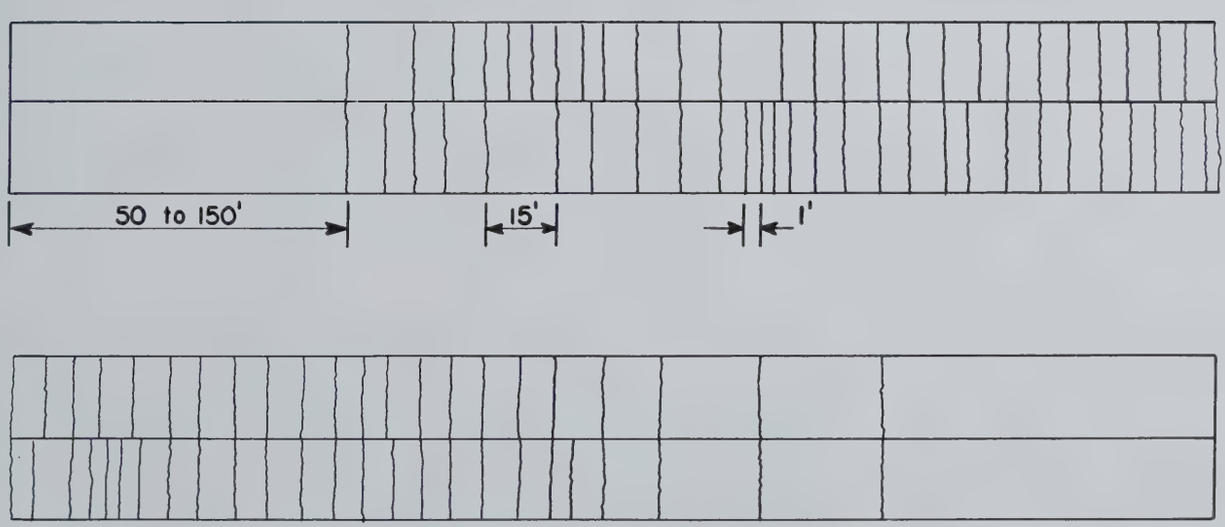


FIGURE 1

TABLE OF
CONTINUOUSLY REINFORCED PAVEMENT DATA

	INDIANA	ILLINOIS	NEW JERSEY	CALIFORNIA	TEXAS	PENN.
Age (Feb. '58)	19 yr. 4 mo.	10 yr. 2 mo.	10 yr. 2 mo.	8 yr. 8 mo.	6 yr. 6 mo.	7 mo.
Thickness	9-7-9	7 & 8"	8 & 10"	8"	8"	7, 8, & 9"
Base	None	None	12 -14"	10"	6 to 8"	None to 6"
% Longitudinal Reinforcing	.07 to 1.82	.3 to 1.0	90 & .72	.63 & .50	.70	.50
Slab Length	20 to 1320'	3500 to 4230'	2 @ 5200'	5280'	575 to 7674'	2 @ 10,806'
Expansion Movement	2 to 4"	2 to 4	1" ?	--	1 to 2" ?	3" provided
Longitudinal Joint	Yes	No	Yes	Yes	Yes	Yes
Steel Placement	Mid-depth	Mid-depth	2 layers-3" from top & bottom	Mid-depth	Mid-depth	Mid-depth
Type of Steel	Intermediate, rail & cold drawn wire.	Rail	Cold drawn wire	Hard grade	Hard grade or rail	Hard grade
Longitudinal Reinf. Size and Spacing	1"ϕ, 3/4"ϕ, & 1/2"ϕ @ 6"c-c	3/8"ϕ, 1/2"ϕ, 5/8"ϕ, & 3/4"ϕ@ 5&6" c-c	3/8"ϕ@3"c-c	1/2"ϕ@ 4&5" c-c	3/4"ϕ@ 8" c-c	5/8"ϕ@ 7, 8, & 9" c-c
Transverse Reinf. Size and Spacing	1/2"ϕ@ 24" c-c	3/8"ϕ@ 12 & 18" c-c	#5 @ 12" c-c	1/2"ϕ@ 60" c-c	1/2"ϕ@ 24" c-c	3/8 "ϕ@ 28 " c-c

Figure 2

forced pavements should be of the same good quality as required for unreinforced pavements. They should be stable and compacted in accordance with the Compaction Ratio Method T.H.D.-110. Subgrades which are subject to swelling and have a potential vertical rise greater than one-half inch will require special treatment as outlined by McDowell in his paper entitled: "Interrelationship of Load, Volume Change and Layer Thickness of Soils to the Behavior of Engineering Structures," published by the Highway Research Board in Volume 35.

Figure 6 is a chart which I have prepared from information in McDowell's paper. This chart will enable the engineer to quickly estimate the potential vertical rise of swelling soils. For example, assume that the subgrade directly under a pavement has a P. I. of 53 and that this layer is twelve feet thick. The P.V.R. that can be expected is two and one-tenth inches. This is illustrated by the solid lines in the figure. Suppose that the above soil stratum has six feet of overburden. The P.V.R. now is one and one-tenth inches. This is illustrated by the dashed lines in the figure. Since the P.V.R. in both cases is greater than one-half inch, steps should be taken to reduce it.

Bases

Bases are used to prevent pumping. When the early continuously reinforced pavements were built, it was thought that they would not pump because cracks would be so small that water could not be pumped up through them. While this is true and pumping at transverse cracks has not occurred, pumping at the pavement edge and at expansion joints has caused some trouble. Therefore, in those instances where subgrades are susceptible to pumping, base courses are recommended to prevent edge pumping.

Figure 7 shows two cross sections, one labeled rural and one labeled urban. The rural section shows a base course where required to prevent pumping and a moisture barrier where required to prevent moisture fluctuations in the subgrade. The urban section depicts a condition where one foot or more has been added for a curb to the right lane next to the shoulder. It is quite possible that a curb and a paved shoulder will prevent edge pumping, thereby eliminating the necessity for a base.

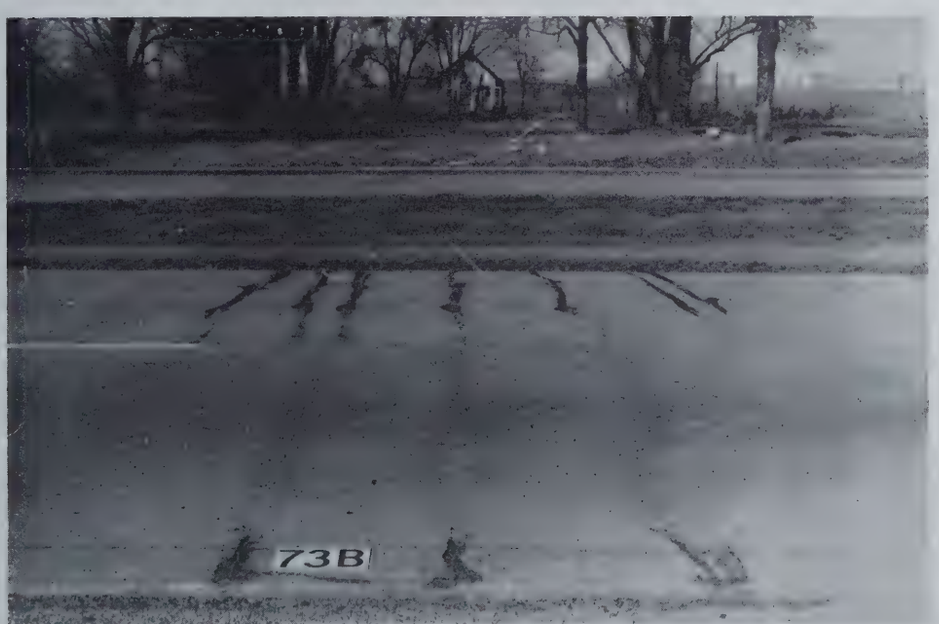
Pavement Depth

Depths from seven to ten inches have been used successfully with continuous reinforcement. Depths of eight to ten inches were usually chosen because they were the standard depths used at the time. Where seven-inch pavements were constructed, it was thought that they would fail and thus afford some basis upon which a minimum depth could be determined. So far, the seven-inch pavements have performed well for a period of ten

INDIANA CONTINUOUS REINFORCEMENT
FIGURE 3.

General view.

Pumping failure at expansion joints.



Close crack spacing. Shows how seal applied inadvertently in 1948 has been worn off by traffic, leaving almost invisible cracks.

years.

Looking at pavement depths from a theoretical standpoint, edge loading without warping is the most critical condition. According to Westergaard's equations, a seven-inch pavement is adequate for a heavy wheel load and a poor subgrade. Now the reason that we can use a seven-inch pavement instead of one nine or ten inches thick, is because the reinforcement effectively keeps cracks closed, or nearly closed, and so we do not have the critical unprotected corner condition which we design for in unreinforced pavements. Furthermore, warping stresses are relieved when the slab cracks and so we need not consider them in our theoretical anaylsis. Where an interior loading condition exists, as for the urban section previously shown, a six-inch pavement is adequate for heavy wheel loads and poor subgrades.

Admittedly, few of us will want to take the risk of trying a six-inch slab where loading is of an interior nature, but we will never know if such a thin slab works unless someone tries it.

Reinforcing Requirements

Reinforcing is used in concrete pavements to keep cracks tightly closed in order to keep out water and dirt, and to maintain the structural integrity of the pavement.

Longitudinal reinforcing quantities for the Columbia Pike and the Indiana pavements were determined from the "Subgrade Drag" theory. In this theory, the longitudinal reinforcing must be of sufficient quantity to drag one-half the slab across the subgrade. Thus, the longer the slab, the more reinforcing required. The 350-foot slab on the Columbia Pike required .43 per cent longitudinal reinforcing and the Indiana slabs, which varied from 20 to 1,320 feet in length, required from .07 per cent to 1.82 per cent longitudinal reinforc-

ILLINOIS CONTINUOUS REINFORCEMENT
FIGURE 4

General view.

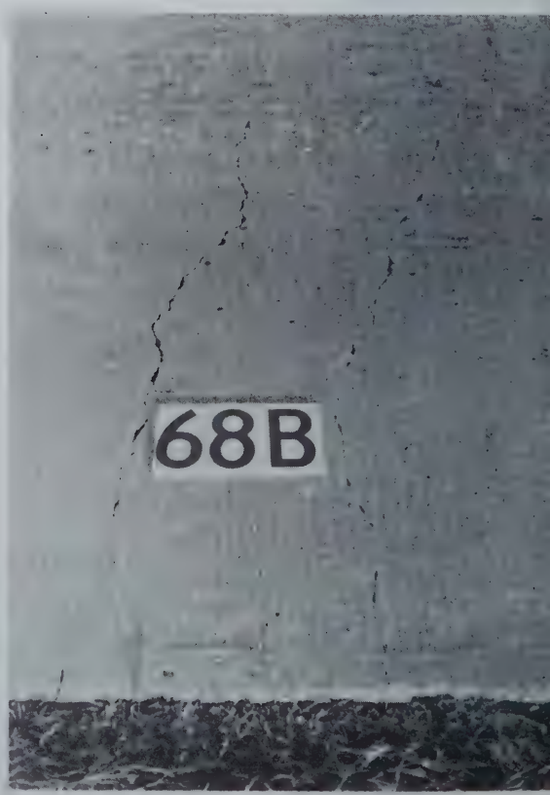
Failure in eight-inch slab near construction joint. Note edge pumping.

ing. After fifteen and one-half years of use, the failures in the Indiana slabs due to inadequate longitudinal reinforcing have been limited to the .07 per cent and .11 per cent slabs. Slabs with .17 per cent have not failed; therefore, it would seem that .17 per cent is the minimum reinforcing required if reinforcing failures are to be prevented.

Early studies of the Indiana pavement showed that crack spacing and crack width decreased as the per cent longitudinal reinforcement increased. Based upon this and the satisfactory performance of all Indiana slabs, an arbitrary value of .5 per cent was suggested as a minimum. Thus, when the Illinois pavements were built, a wide range of longitudinal reinforcing varying from .3 per cent to 1 per cent was selected. It was thought that the .3 per cent reinforcing would fail and that the .5 per cent or .7 per cent would prove adequate. However, after ten years of service, pavements containing .3 per cent have not suffered a single failure due to inadequate reinforcement. Based upon the Indiana findings, it seems safe to predict that .3 per cent is more than adequate.

The amount of longitudinal reinforcing for some of the more recent pavements has been based upon experience and personal preference and has not been less than .5 per cent.

Until more information is known about the performance of continuous reinforcement, we will have to determine our longitudinal reinforcement requirements from experience. From the information available, I would say that .5 per cent is a conservative figure and that possibly .3 per cent will be found to be adequate in the future.



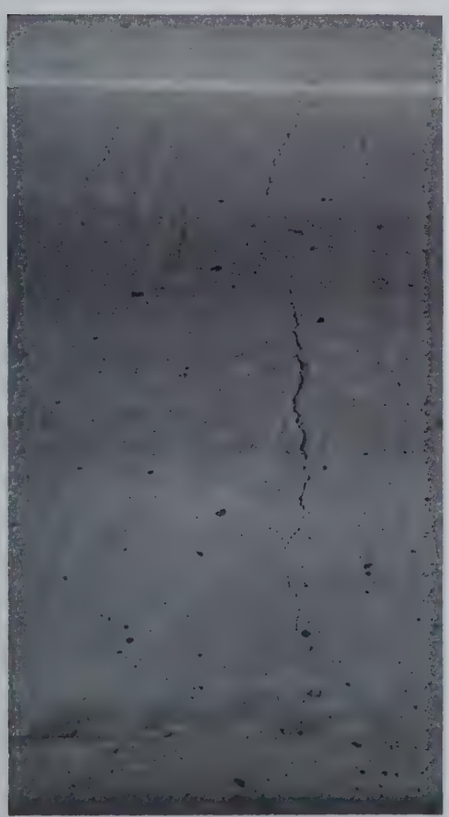
Cracking at one-foot intervals. Usual spacing is four to twelve feet.

High-strength steel should be used for continuous reinforcement since it does not cost any more than structural grade and since the higher yield point may be advantageous. Intermediate grade, hard grade, rail steel, and cold-drawn wire mesh have proven satisfactory. Reinforcement should be placed at mid-depth to insure adequate cover and be supported on chairs to insure proper placing and lapping. A minimum lap of twenty bar diameters or one mesh is thought to be adequate. Longitudinal bar spacing of not over twelve inches is recommended for effective stress distribution.

Transverse reinforcement is needed only to keep the longitudinal center joints closed. This is done with one-half-inch round tie bars at 30-inch center to center in unreinforced pavements. In order to help support the longitudinal bars in continuously reinforced pavements, transverse bars, extending across the full pavement width are used. One-half-inch round bars at 30-inch center to center seems reasonable to perform this function.

Joints

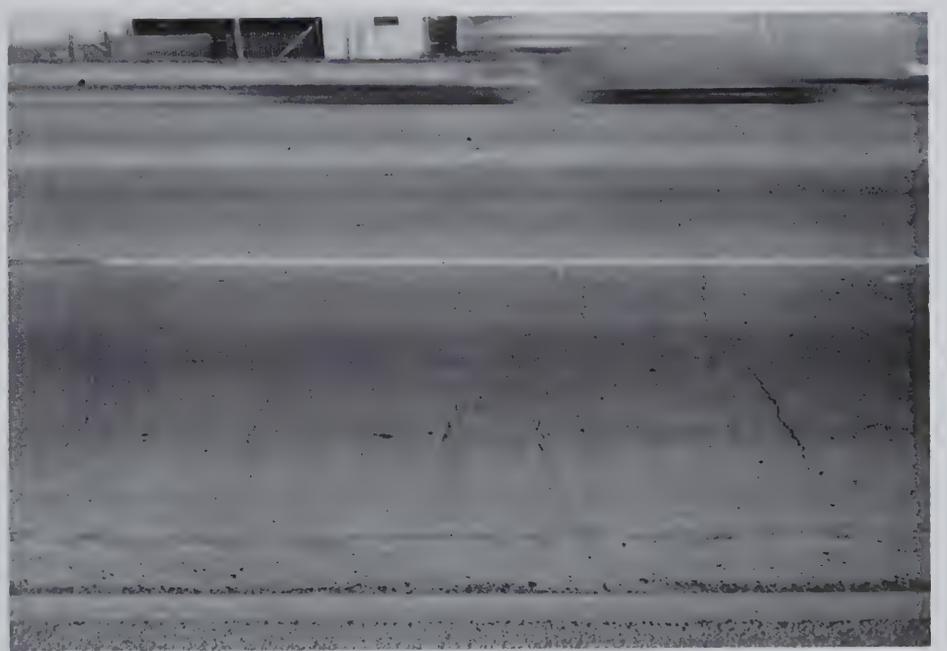
Joints are needed in concrete pavements to permit contraction and expansion. They must be water-tight and able to transfer wheel loads from one slab to another.



Close-up of typical crack. Note wearing in wheel paths which makes crack appear wide.

FORT WORTH CONTINUOUS REINFORCEMENT
FIGURE 5

General view.



Close crack spacing (one to three feet) in central portion of eight-inch slab with .7 per cent steel.

Experience has shown that the transverse cracks in continuous reinforcement are contraction cracks and that they have not been a source of weakness or trouble. Experience also has shown that where transverse joints were used in continuous reinforcement, they were completely ineffective in controlling cracking.

Therefore, transverse joints are not necessary.

A longitudinal joint is recommended to prevent erratic longitudinal cracking such as that which occurred in the Illinois pavements, where a longitudinal joint was not used. Erratic longitudinal cracking is unsightly and can be seen by a driver.

As has already been explained, only the end portion of a slab expands and contracts. This movement varies from one to four inches, depending upon when measurements are made. Measurements made in November, 1957, on the Fort Worth pavements showed that expansion joints at the end of bridge-approach slabs were from one to two inches wider than when constructed.

Because most continuously reinforced pavement failures can be attributed to expansion joints, and because long sections of continuously reinforced pavement can be constructed without expansion joints, it is suggested that expansion joints be used only at ends of structures on which it is not feasible to carry the slab continuously across.

Figure 8 shows a suggested treatment for bridge ends. Note that expansion space is provided only at the bridge where a finger joint is proposed. Also note that the bridge-approach slab is part of the continuously reinforced slab, thus eliminating a joint between it and the pavement.

At a recent Highway Research Board Meeting, Professor Zuk, from the University of Virginia, suggested an anchorage system for continuously reinforced pavements instead of expansion joints. From model studies, he developed the design shown in Figure 8. Such an anchorage system may be less expensive than an expansion joint; however, there is doubt in the minds of some as to whether it will hold under long periods of expansive force.

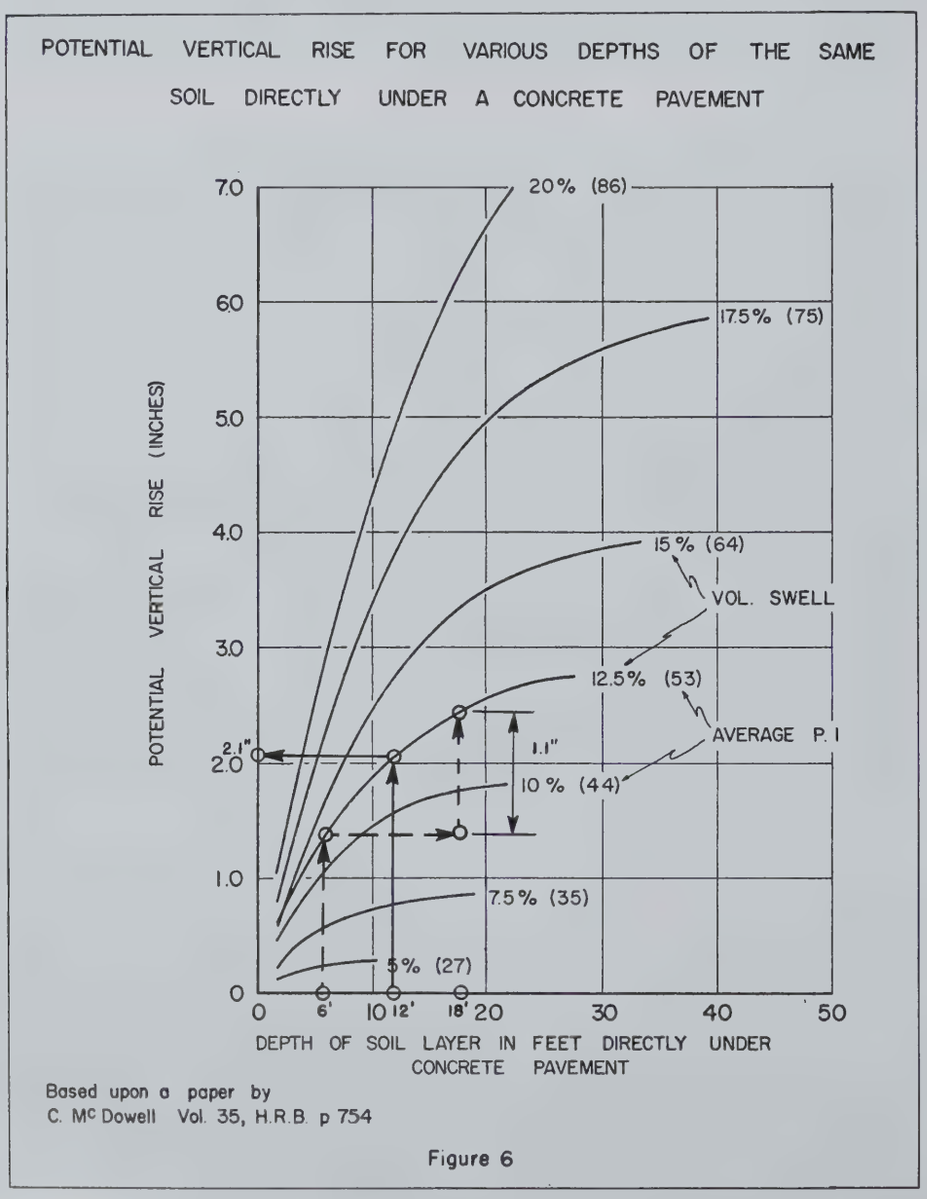


Figure 6

Comparative Pavement Costs

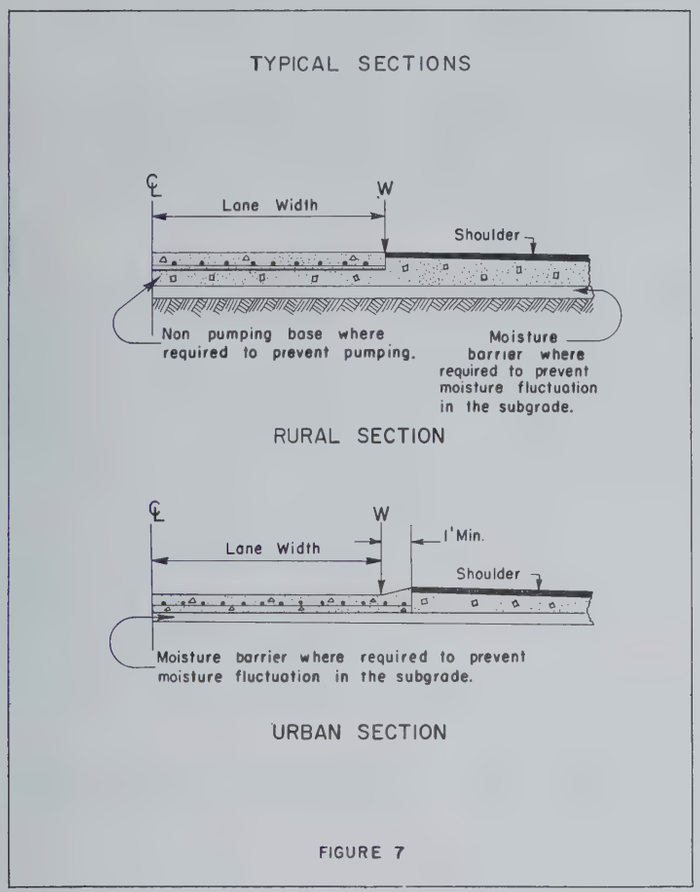
When advantage is taken of thin sections and low steel quantities, continuous reinforcement can compete favorably with any of our unreinforced pavements. Assuming that subgrade treatment and base courses are required in equal amounts for an unreinforced and continuously reinforced pavement, then the only difference between the two is the cost of concrete, joints, and reinforcing. Cost comparisons from other states indicate that continuous reinforcement costs from 20 per cent more to 15 per cent less than standard pavement, depending upon the type of standard pavement that was used for the comparison. Figure 9 shows an approximate comparison between an unreinforced ten-inch pavement and two different designs of continuously reinforced pavement. In one design, the continuously reinforced pavement costs slightly more and in the other design, it costs slightly less than the unreinforced pavement.

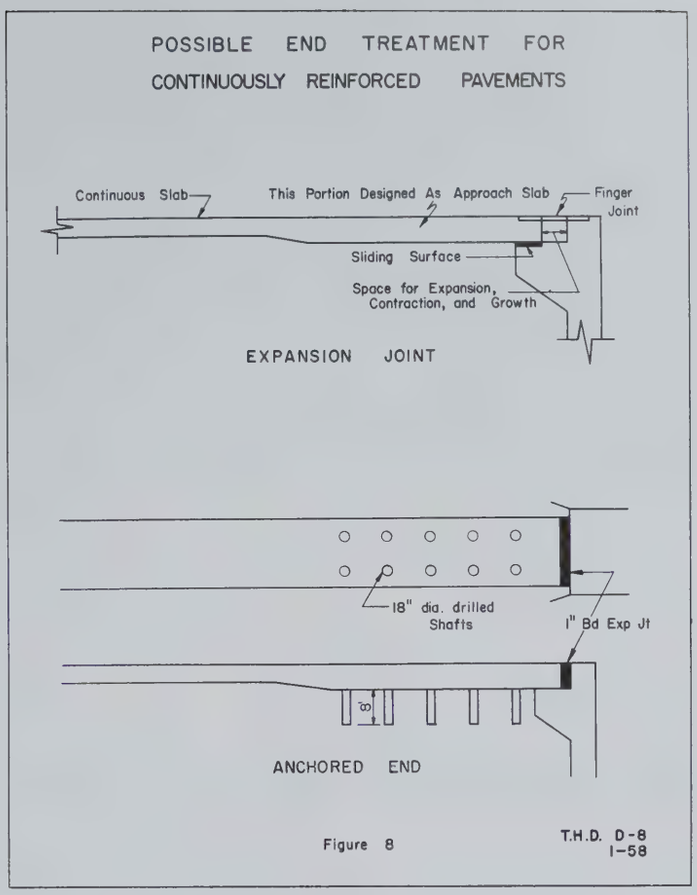
States having continuously reinforced pavements report that the maintenance on them has been much less than on their standard pavements. It is my understanding that our seven-year-old Fort Worth pavement has not yet required any maintenance. Therefore, reduced maintenance costs can be expected to make the continuously reinforced pavement even less costly over a long period.

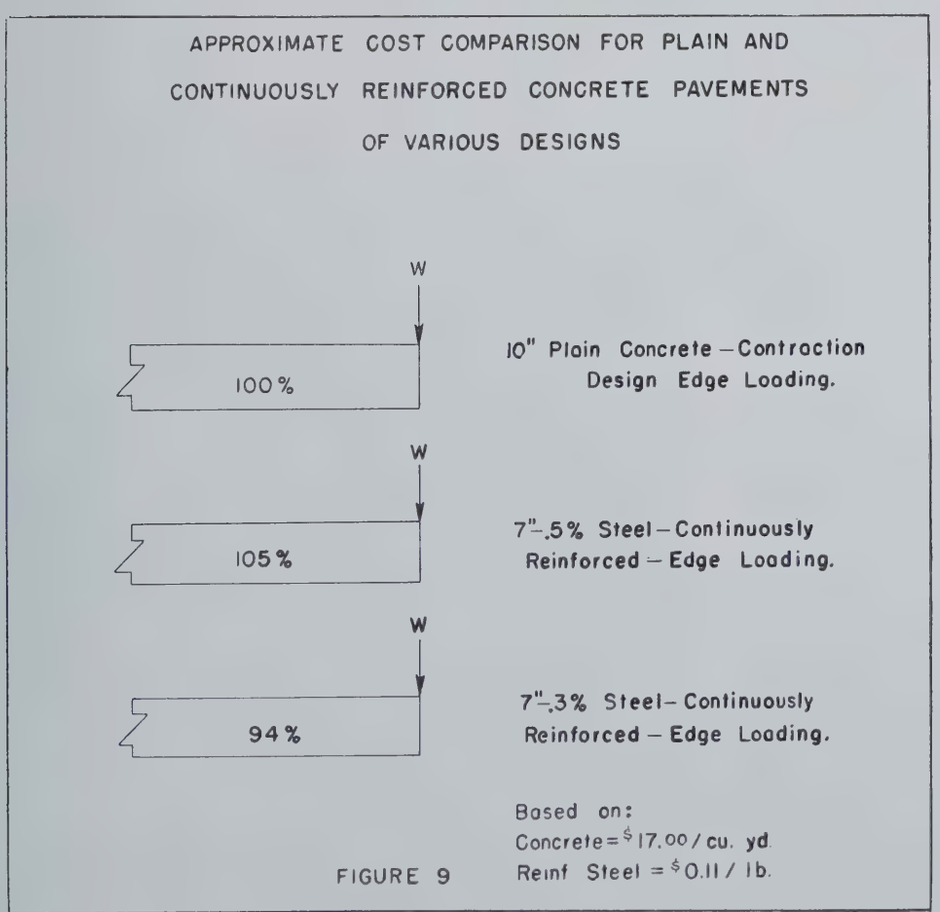
Conclusion

In conclusion let me briefly summarize.

1. Continuously reinforced pavements are recommended for high-volume, heavy-duty pavements where






APPROXIMATE COST COMPARISON FOR PLAIN AND CONTINUOUSLY REINFORCED CONCRETE PAVEMENTS OF VARIOUS DESIGNS
W
100%
10" Plain Concrete – Contraction Design Edge Loading.
W
105%
7"-.5% Steel – Continuously Reinforced – Edge Loading.
W
94%
7"-.3% Steel – Continuously Reinforced – Edge Loading.
Based on:
Concrete = $17.00 / cu. yd.
Reinf Steel = $0.11 / lb.
FIGURE 9

interruptions for maintenance are costly and hazardous.

2. Continuously reinforced pavements have exceptionally smooth riding surfaces.

3. Continuously reinforced pavement costs are comparable with our thick standard pavement costs.

4. Continuously reinforced pavements require very little maintenance.

5. Subgrade treatment is required as for standard pavements.

6. Bases are required on pumping subgrades to control edge pumping.

7. A seven-inch slab with .5 per cent longitudinal reinforcing is an acceptable but conservative design. Three-tenths per cent longitudinal reinforcing may prove to be satisfactory in the future.

8. Longitudinal joints are desirable to control longitudinal cracking.

9. Transverse joints are not required.

10. Expansion joints are required only at ends of structures on which it is not feasible to carry the slab continuously across.

TPEA WINNER

The amount of time and paper work needed in preparing the monthly report on the status of D-18 day-labor projects for the Austin office has been drastically reduced due to a suggestion by John W. Jones, Senior Draftsman, Beaumont.

Jones was First-prize winner of the TPEA Merit Award Contest, February 1957. The contest is held twice each year to encourage development of new ideas and good work among public employees.

Before innovation of the revised Form 314 system last May, a day was required, with normal interruptions, for preparation of data for submission to the Austin Office. Each job folder had to be reviewed, carbons inserted into 60 or 70 sets of Form 314, and copies signed and reviewed by the Maintenance Superintendent. This processing time has been cut to two or three hours.

As E. W. Parmer, District Administrative Engineer of Beaumont, stated recently, "This is a case where an idea submitted by an employee not only won for him $100 in cash . . . but also brought about the saving of many man-hours of work per month for the Department."

Texas Highway Department
Form 314 5-54-30m

RESIDENT ENGINEER'S MONTHLY CONSTRUCTION REPORT

County ..... Date .....
Project No. ..... Estimate No. .....
Contractor .....
Type of Work .....

Date Work Began ..... Date of Completion .....
Time Used to Date ..... days. Percent time used .....
Total Est. Cost ..... Amount This Est. .....
Total Estimate to Date ..... % Completion .....

FORCE USED ITEM	AVERAGE NO. USED	NO. DAYS
Administration		
Skilled Labor		
Intermediate Grade Labor		
Unskilled Labor		

EQUIPMENT USED ITEM	AVERAGE NO. USED	NO. DAYS

(Over) Resident Engineer

Old form, front.

Texas Highway Dept.
Form D-18-6

MONTHLY REPORT ON STATUS OF DAY LABOR PROJECTS
FOR MONTH OF _____ 19___, DISTRICT NO. ___

COUNTY	HWY. NO.	PROJECT NO.	LIMITS	TOTALS EST. COST	TOTALS EST. TO DATE	AMOUNT THIS REPORT	DATE WORK BEGAN	% COM-PLETE	DATE OF COM-PLETION

PROJECTS TO BE LISTED IN ALPHABETICAL ORDER BY COUNTIES.
THIS FORM TO BE USED ONLY FOR PROJECTS HANDLED BY D-18, SINGLE COPY TO BE SUBMITTED.
SHOW REMARKS IMMEDIATELY BELOW PROJECT.

New form.

FOR DISTRIBUTING COSTS ON CONTRACTS COVERING MULTIPLE PROJECTS

County	Project	Amount This Estimate	Total Estimate To Date	Per Cent Complete

Old form, back.

This park, on U. S. 290 east of Ozona, was designed by Harold Bowen, Senior Landscape Adviser in Maintenance Operations Division, and was built under the supervision of Scottie Houston, Senior Maintenance Foreman at Ozona.

1958 Style

District 7 Roadside Parks

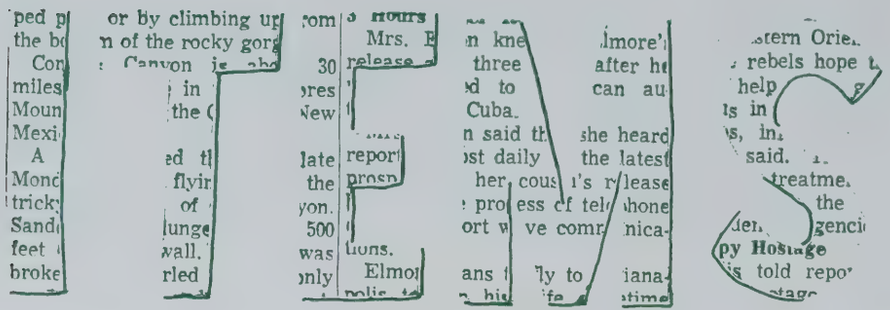
R. N. Jennings, District Maintenance Engineer
District 7

Roadside parks pictured here have been completed in District 7 during 1958.

Designed by and constructed under the supervision of H. P. Largent, Senior Maintenance Foreman at Ballinger, this roadside park is located on U. S. 277 north of Bronte.

This roadside park, on U. S. 83 south of Menard, was also designed by Harold Bowen, and was built under the supervision of W. E. Macek, Senior Maintenance Foreman at Eden.

HIGHWAY



Tyler Morning Telegraph

It was bound to happen sooner or later. And a post card from an anonymous sender reveals it happened sooner.

Someone called the State Highway Department barn on the Frankston Highway and asked to come out and bury a dog that was run over in front of their house. Two of the highway boys arrived at the scene, dug a hole on the right-of-way and grabbed the dog to put him in.

That's as far as it went because the dog then raised up, took a good look around and scampered away as fast as any dog the men had ever seen.

FORT WORTH STAR-TELEGRAM

This Is West Texas

BY GEORGE DOLAN

THEY'RE INFORMATIVE.

Texas' highway department, which does such an excellent job with warning signs, affords drivers a chuckle below Junction, on the highway to Kerrville.

Its sign says, simply, "Hill."

It's right, too. Just on down the road a piece, there it is. A hill.

Without that sign, you assume, drivers would spend the rest of their trips wondering what in tarnation that big bump was back yonder.

Condemn billboards as blots on the landscape if you will. I'll sum up my argument with a remark made by a West Texan after he'd heard over the radio that fog had cut visibility to zero.

"Don't make much difference," he said, "they ain't nuthin much to see anyways."

THE CHAMPION, Center, Texas, Thursday, May 15, 1958

Five thousand, eight hundred and ten days.

That's lots of days to run a maintenance crew without having a lost accident, but that's the accomplishment of the Shelby County's Highway Department maintenance workers. They were recently congratulated for their state safety record by D. C. Greer, Texas Highway Department Engineer.

In the top picture are W B Rudd, maintenance foreman, Herbert Corbitt, A. M. Lucas, Bob Ford, Buren Chandler, T. W. Warr, H. R. Porterfield, E. W. Wilson, E. M. Moody, T. O. Graves, Jowell Askew, Billy Hughes, D. B. Campbell, J. N. Wilson, Fred L. Johnson, Frank Cooper and Bud Lovell.

Unable to be present for the picture were L. E. Windham, Henry Porterfield, Lem Hudson and Byron McDaniel. In the lower picture are Mr. Rudd and Mr. Warr looking at a sign in front of the Highway Department warehouse. The numbers indicate that it's 15 days short on posting.

Mr. Warr was the last man seriously hurt in the crew. He was burned by a blow torch on July 16, 1942, long before the new warehouse was built. Mr. Rudd will have 40 years service with the department come next February.

Mr. Rudd isn't superstitious about safety. He knows it's just a day to day grind of being careful and being constantly alert.

OVER THE HIGHWAYS

Comments . . . from the Traveling Public

On May 22, our Southern Division Superintendent, W. G. Hazlewood, was passing through . . . . . A highway truck loaded with pea gravel, traveling at a speed of some 45 or 50 mph met the car being driven by the Superintendent and the Superintendent's car was showered with gravel flying from the pea gravel loaded on the truck, resulting in damage to the windshield of the Superintendent's car.

Investigation revealed that no insurance is carried by the State on these trucks and our Superintendent was unable to secure the license number of the passing truck.

It is our thought that possibly some type of cover (possibly a tarpaulin) could be used to cover the loaded gravel, thereby eliminating the type of damage experienced by this Superintendent.

Anything you may be able to do toward the elimination of this hazard will be appreciated.

J. M. Lowry
St. Louis Southwestern
Railway Lines
Tyler, Texas

We have recently returned from a trip to Florida by auto, pulling a fifteen-foot vacation trailer. While we did stay overnight in trailer parks, we made breakfast and lunch stops at roadside parks.

We want to let you know how impressed we were with your very nice roadside parks. We crossed your state twice—from Clovis, New Mexico, to Shreveport, Louisiana, and return—by different routes.

The beautiful park at Marshall with the wisteria was probably the prettiest, but the concrete shelter in the treeless western plains was equally welcome. We found them clean and attractive and well cared for.

This is written as a thank-you note, but I will add one suggestion. In Louisiana they put signs five miles ahead of each wayside. This is indeed welcome when wondering if we should try stopping on the shoulder or go ahead on the chance that there will be a park.

Dorothea J. DeLollis
Albuquerque, New Mexico

Your attendant at Denison is very efficient and courteous. He was of great help. The wideness and good maintenance of Routes 75, 77, and 81 are excellent. Roads are in much better condition than adjacent states.

Ed Ferraro
Brockway, Pennsylvania

While driving on U.S. . , my 1958 Buick automobile was damaged by flying gravel caused by one of your Department's pieces of equipment.

It happened about 3:45 P.M. June 8, 1958. Your truck and sweeper were going from 40 to 45 mph approximately and as they topped a rise there seemed to be a solid sheet of rocks in front of me. Although my car was only traveling approximately 45 mph, the flying gravel damaged my windshield, paint, and broke three head lamps.

Since your Department is noted for its courtesy to the driving public, especially when construction and repairs are going on, I was bitterly disappointed at the flagrant danger presented by this equipment which damaged my car. It could have been even more dangerous to a driver in an open car where personal injury might have resulted.

Homer Hall
Lubbock, Texas

I sure would enjoy receiving a map of the Great State of Texas. I spent a couple of years at the Naval Base at Corpus in 1941 and just can't get Texas out of my blood.

Philip J. McGrail
Worcester, Massachusetts

To and From Our Readers

. . . I would like to inquire if back issues of TEXAS HIGHWAYS can be obtained at the regular subscription rate or otherwise. Since leaving the Department two years ago I have missed the useful and interesting information contained in TEXAS HIGHWAYS and would be interested in obtaining the last two year's issues.

Frederick A. Harris
Consulting Civil Engineer
Houston, Texas

◈ *Mr. Harris was formerly Senior Laboratory Engineer with the Houston Urban Expressway office.*

The Board, which is the chief authority for the design and construction of roads and bridges in the State of Victoria, Australia, would like to receive a regular copy of TEXAS HIGHWAYS. Several copies have been read with great interest by the Board's engineers, who find many of the articles relevant to their work.

R. E. Donaldson
Victoria, Australia

The May issue of TEXAS HIGHWAYS carried a picture on the cover of a park just a few miles out of Rusk, Texas, which is the town I live in. All three girls are from Rusk and one of the girls is my daughter, Judy Banks. This gave me as well as Judy and all the rest of our family and friends quite a thrill. Naturally we consider it an honor that this part of Texas and our hometown girls were chosen for this picture. I think we live in a beautiful part of Texas and I also think credit is due to the Highway Department here in this territory. They do a wonderful job making our highways and parks beautiful. So many people visiting here make the remark how pretty the parks, highways, and drives are around here.

Mrs. Lynn Banks
Rusk, Texas

"Theres someone here regarding a field party that crossed his property!"

About the Cover . . .

One of the most attractive approaches to any city in the state is that to the Capital City of Austin along U. S. 81 from the south.

The State Capitol and The University of Texas Tower provide a backdrop, and the latest in wide, modern, four- and six-lane divided highway with frontage road makes this section of expressway one of the most beautiful in the state.

Completed in April of 1955, this section is a part of Interstate Highway 35.

TEXAS HIGHWAY COMMISSION

MARSHALL FORMBY	Chairman
HERBERT C. PETRY JR.	Member
CHARLES F. HAWN	Member
D. C. GREER	State Highway Engineer

Texas Highways

TEXAS HIGHWAYS, official journal of the Texas Highway Department, is published in the interest of highway development in Texas and for departmental education in the improvement of construction, maintenance, and operation.

All material and manuscripts should be directed to the Editorial Office, Division of Information and Statistics, Texas Highway Department, Austin 14, Texas.

HIGHWAY SIDELIGHTS

By Gordon K. Shearer
Director of Research, Texas State Parks Board

Swing a circle on the Texas Official Highway Travel Map about West Columbia where Texas Highways 35 and 36 cross and within a radius of a few miles you embrace some of the most historic spots in the state.

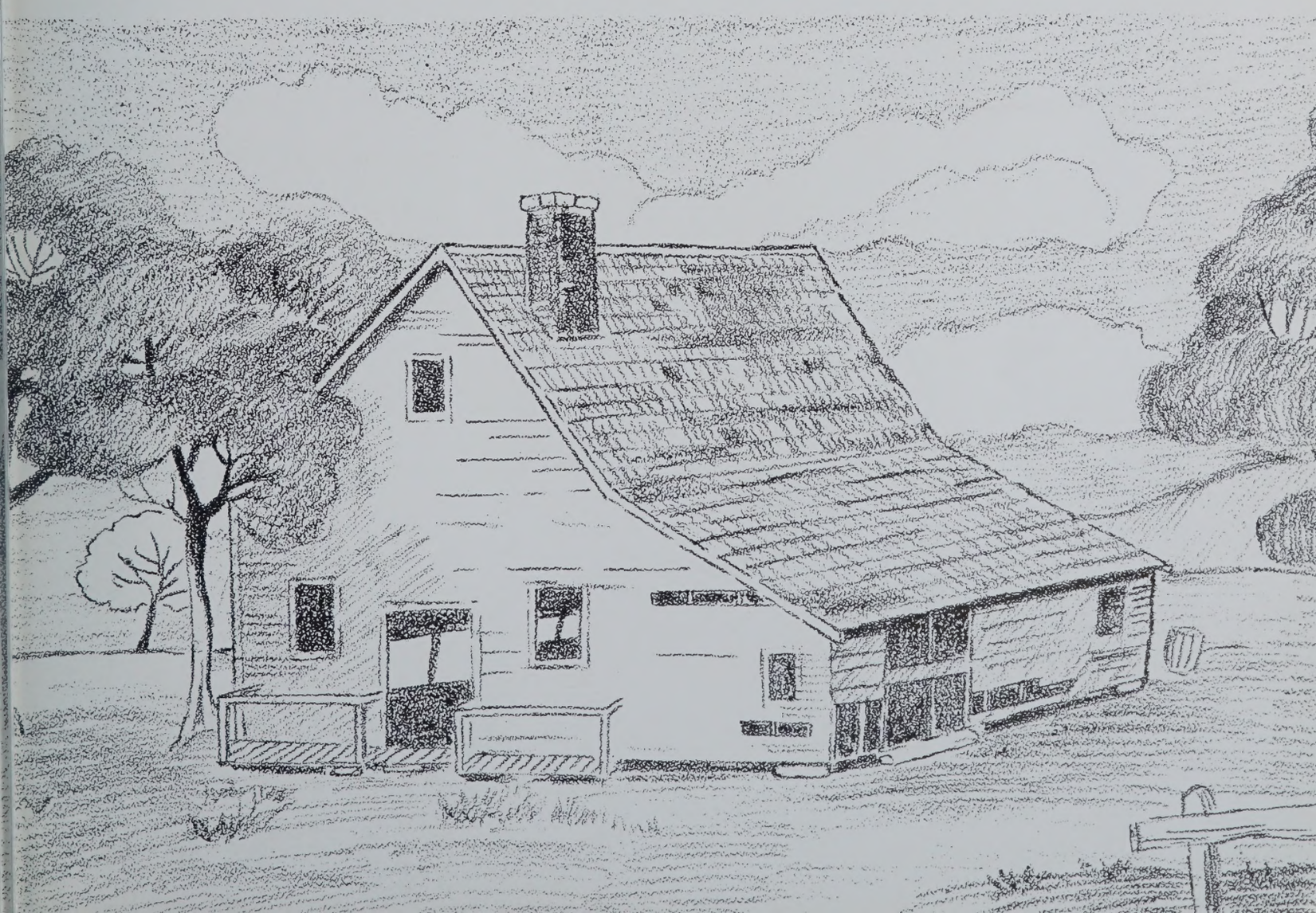
Here was the first capitol of the Republic of Texas. Today, a stone marker locates the spot that was the seat of government in 1836-1837. A few yards to the west, still standing, is one of the great oak trees under which official ceremonies were conducted prior to the use of the story-and-a-half frame building to house government agencies. It was under these trees that Provisional President David G. Burnet delivered his farewell address, and General Sam Houston was installed.

Another tree in the historic circle about West Columbia shaded an earlier event of note. Under its branches the first Masonic Lodge in Texas was organized in 1835.

The Congress of the Republic of Texas began its sessions at this place October 3, 1836. It was then known simply as Columbia.

An attack of pneumonia that was the immediate cause of the death of Stephen F. Austin is blamed on rigors he underwent in the poorly heated capitol while he was Secretary of State.

Here also was Jane Long's Tavern where magnificent if unfulfilled plans were made for conquest. The local cemetery has graves of leaders of the "Old Three Hundred." That was the name given to first settlers of the Austin Colony.

Three historic plantations are nearby. The trio are Peach Point, Varner-Hogg, and Phelps plantations. Peach Point was the place selected by Austin for the home of his sister. He spent much time at Peach Point and, upon his death, was buried there. Later his remains were taken to the State Cemetery in Austin. Varner-Hogg plantation, a part of which with the plantation house now is a state park, was an 1824 grant of land to Martin Varner. Here was manufactured the first rum produced in Texas. Mexican General Santa Anna was held prisoner at Phelps plantation after his defeat at San Jacinto battlefield.

At Varner-Hogg plantation house, from the balcony of which float the six flags under which it has existed, there is a remarkable collection of mementos of the historic periods through which it has endured, from its first occupancy to its last individual ownership by Governor James Stephen Hogg.